SUMMARY OF MINUTES OF HESSIAN FLY CONFERENCE, WASHINGTON, D. C.

January 5, 1925

A conference of the leaders and other workers in the Hession fly project of the branch of Cereal and Forage Insect Investigations of the United States Bureau of Entomology was held in the Entomology Annex Building in Washington on January 5, 1925. The following individuals were present:

Ainslie, C. N. - Sioux City, Iowa.
Ainslie, G. G. - Knoxville, Tenn.
Cartwright, W.B. - Centralia, Ill.
Dean, Geo. A. - Washington, D. C. (Chairman).
Hill, C. C. - Carlisle, Pa.
Horton, J. R. - Wichita, Kans.
Lane, M. C. - Toppenish, Wash.
Larrimer, W. H. - West Lafayette, Ind.
Luginbill, P. - Columbia, S. C.
Myers, P. R. - Carlisle, Pa.
Phillips, W. J. - Charlottesville, Va.
Reeves, G. I. - Salt Lake City, Utah.
Satterthwait, A.F. - Kirkwood, Mo.
Smith, H. D. - Carlisle, Pa.
Wade, J. S. - Washington, D. C. (Secretary).
Walton, W. R. - Washington, D. C.

Forenoon Session

The conference was called to order at 9.30 a.m. by the Chairman.

The minutes of the previous meeting were read and approved. The Chairman then made a brief address in which were outlined the general purposes of the conference, namely, to discuss progress in Hessian fly investigations since the previous meeting and to formulate plans with especial reference to work in various methods of obtaining percentage of infestation, percentage of parasitism, plat yields, new host plants, and special local problems. Among the various phases of these topics considered by the conference were the following:

I. - The informal report of the Committee (Horton, Larrimer) appointed at the previous meeting to prepare a summary of the Hessian Fly notes already accumulated in the files of the Cereal and Forage Office in Washington. This work had not advanced very far and was not yet half completed, because of prolonged delay in getting the notes copied and forwarded to the Committee, and because of inability to spare sufficient time from other duties to perform the work. Then, too, it had been found that much of the information was somewhat disconnected and considerable labor was necessary in order to assemble it under the various subdivisions of

the general subject. In discussion of this topic, the importance and necessity was emphasized of getting this summary completed as soon as practicable, in order that all the workers might have exact knowledge as to what work had already been done on the problem and what work was most needed in continuing it (Horton, Larrimer, Walton, Dean).

II. - A discussion of two manuscripts from the West Lafayette, Indiana, laboratory, which had been submitted tentatively for criticism by the other workers and for possible publication in the Journal of Agricultural Research, the titles of these papers being as follows:

"Statistical Methods Applied to Studies of the Hessian Fly (Phytophaga destructor Say). I.- Determination of Percentage of Infestation."

"Statistical Methods Applied to Studies of the Hessian Fly (Phytophaga destructor Say). II. - The Determination of the Yield of Wheat Plats by the Five-Square-Yard Method."

After discussion of this topic it was agreed that copies of these papers should be prepared by the Indiana Laboratory and should be submitted to the other Hessian fly workers of the Bureau for criticisms and suggestions. It was further agreed that the corrected manuscripts be returned by the other workers within one month after receipt. (Larrimer, Dean, Horton, Hill.)

III. - A discussion of the progress made subsequent to the last meeting in the accumulation and correlation of data in relation to methods of obtaining per cent of infestation and plat yields in connection with standard deviation and probable error, especial reference being made to statistical methods (Larrimer, Dean, Horton, Hill, Cartwright, G. G. Ainslie, Myers, Phillips, Satterthwait).

In the discussion of the relation of statistical methods to Hessian fly infestation the following works were recommended (Larrimer, Cartwright) as being especially helpful:

The Elements of Statistical Method, by W. King. MacMillan Co. $2.
A First Course in Statistics, by D. C. Jones. G. Bell & Sons, London. $3.75.
An Introduction to Statistical Methods, by Horace Sechrist. MacMillan Co. (1920). $2.
An Introduction to the Mathematical Analysis of Statistics, by H. C. Forsyth. John Wiley & Sons. $2.25.
Handbook of Mathematical Statistics, by H. L. Rietz. (1924).
Statistical Methods, by Truman L. Kelly. (1924).

There was general discussion of methods of taking counts, size of samples taken, varying numbers of plants used, and number of plants as compared with definite areas used in obtaining percentage of infestation, under varying conditions in different sections (Myers, Larrimer, Horton, Hill).

No reason was seen for making counts of tillers, as well as of plants, in the fall. It was believed useful to count plants only. (Larrimer.) In determination of infestation it was emphasized that one could take any number of plants desired if one were willing to accept the limitations of the method used (Larrimer). The desirability of cooperation along this line with agronomists was emphasized (Hill), although it was pointed out that considerable could be accomplished through the use of mathematics by entomologists working alone (Larrimer).

There was also an exchange of information on details of various methods in use at the different stations and comparison of merits and demerits, especially as to what methods may be used in obtaining percentage of infestation. It was pointed out that the infestation would vary greatly in the same field in accordance with such other variables as number of plants, number of tillers, asymmetrical distribution of eggs by the fly, moisture, and others. (Larrimer, Cartwright, Hill, Myers, G. G. Ainslie, Horton, Phillips, Dean, Wade.) The use of number of tillers in relation to other factors was discussed at length and the value of such in fields for comparative study was pointed out (Larrimer, Hill, Horton). The advisability of counting plants only in the fall, and culms only in the summer examination was pointed out (Larrimer). It was stated that experiments showing a comparison of various methods of getting the percentage of infestation indicated as many different percentages of infestation as there were different methods (Horton). In discussing the value of mathematics, it was pointed out that the error depended upon the number of plants in the sample and the per cent of infestation, and that it was not necessary to examine all plants in a given plat provided representative samples were taken (Horton, G.G.Ainslie, Larrimer). In discussion of methods of sample infestation and theory of samples, it was indicated that one would only get infestation for sample and not for entire field (Hill). The value of spring and summer observations as well as fall observations was pointed out (Satterthwait). There was also discussion of the size of field in relation to taking samples and in obtaining accuracy of results (G. G. Ainslie, Lane, Hill, Horton).

In discussion of this topic by the Chairman, the value of uniform methods and correlation of mathematical work with that of the agronomists and the adaptation of their methods where possible were emphasized. The desirability of adopting some good method and of giving it a thorough trial was urged, especially in relation to uniformity of methods of getting samples and in present lack of uniformity in getting percentage of infestation. Considerable discussion followed on various methods of taking counts, including the adoption of a uniform standard that would include measurements, the difficulty in finding data, the difficulty in counting plants in the field, and the multiplying of data to figures of a size beyond easy comprehension (Myers, Lane, Horton, Hill, Walton, Satterthwait, Cartwright).

The matter of attempting to compare spring and fall infestations, the improbability of getting figures that could be compared, and the difference between the problems of the agronomist and the entomologist were discussed (Hill, Horton, Lane, Myers). The relative importance of plants

vs. unit areas as factors affecting yield and the number of flies per acre, or per plant, in relation to tiller methods was considered (Hill, Lane, Myers, C. N. Ainslie, Dean). The lack of sufficient previous work on correlation, and the difficulty of arriving at satisfactory results because of weather and other factors, were emphasized (Dean). Lack of knowledge as to how much fall infestation reduces actual yield, and the presence of other factors which may overcome fly infestation was indicated (Larrimer).

IV. - A brief resume was given on present Hessian fly conditions in Tennessee in relation to barley culture, and suggestions were requested. It was emphasized that the fall brood seemed to be of comparatively little importance. (G. G. Ainslie.) It was pointed out that under the present system of rotation in Tennessee, conditions are excellent for increase of the fly. Examples were cited of heavy spring infestation, where no fall infestation was to be found. Cooperative work with the State people and possible results to be obtained from such work were discussed. (G. G. Ainslie, Dean, Reeves.)

V. - Effects of weather, especially of wind and blowing sand, on variations of distribution and habits of flies in different sections of the country were considered (Reeves, Lane, C. N. Ainslie, Satterthwait); also fly dispersion in relation to weather and to amount of wheat seed sown per acre, and the possible value of fly infestation in reducing a heavy to a normal stand of wheat (Reeves, Hill, Larrimer, Satterthwait, G. G. Ainslie, C. N. Ainslie, Dean). In connection with the attraction of flies to small or large tillers it was agreed that most flies were attracted to small plants, and examples were given (Satterthwait, C. N. Ainslie, Larrimer, Dean). An instance was given in which oiled dust from a highway made fly infestation lighter along the edge of an adjacent field. It was also pointed out that in the event that fall infestation should occasionally prove to be beneficial to the growing crop, it might appear that the farmer was sowing too much wheat per acre. In northwestern Kansas, three pecks had been found by the Hays Experiment Station to be sufficient, although farmers often sow larger quantities making allowance for probable losses from insects and from adverse weather conditions. (Dean, Horton, G. G. Ainslie, Hill.) The value of delayed fall planting at the earliest "safe" date was agreed upon by the entire conference.

VI. - The conference was honored by a visit from Dr. L. O. Howard, Chief of Bureau, who, in course of a short address, congratulated the members of the conference on their splendid record for satisfactory work in the past and excellent prospects for even better work in the future. He also gave some general observations and instructions regarding the influence and conduct of entomologists when representing the United States Government in field work, and he illustrated the points made by some personal reminiscences.

VII. - In consideration by the Chairman of the desirability of the inauguration in the near future of intensive and nation-wide ecological studies of the Hessian fly under the supervision of a highly trained

ecologist, it was pointed out that it would be a matter of extreme difficulty, if not impossibility, to obtain an outstanding ecologist who could be persuaded to take up such work. There was considerable discussion of various phases of ecological work that might be emphasized, such as periodicity of outbreaks, predicting outbreaks, climatic variations, and relation to phenology and to plant growth and to other insect investigations. Consideration also was given to the recent work of Shelford, Babcock, Chapman, Cook, Hyslop, and others in correlating data and in finding what facts are significant. It was then agreed to defer action regarding intensive ecological phases of the investigations until after the summary of the office notes had been completed, as it was realized that much information of considerable value probably would be obtained therefrom. (Dean, Horton, Lane, Reeves, Phillips, C. N. Ainslie, Larrimer, Hill, Walton, Wade, Satterthwait.)

The conference adjourned for lunch at 11.45 a.m.

Afternoon Session

The conference was called to order by the Chairman at 1.30 p.m., immediately following the taking by the Bureau photographer of a group photograph of the members of the conference.

VIII. - The afternoon session opened with a discussion of the known host plants of the Hessian fly and the following possible new host records recently accumulated were given: Agropyron smithii Rydb., Elymus virginicus L., E. canadensis L., and one or two others not authoritatively identified. (Horton). Hordeum jubatum L. (C. N. Ainslie). A few larvae were reported on rye (Cartwright). Eggs were reported on oats though no larvae had been established (Larrimer). Eggs were reported on Setaria sp. (Satterthwait). There was considerable discussion of spelt, emmer, and rye as possible hosts (Myers, Cartwright, Larrimer, C. N. Ainslie, Horton).

IX. - A brief review of the present status of the parasite work was furnished (Myers) in which it was indicated that no severe outbreaks had occurred since 1915 in the general territory under observation by the Carlisle station, and it seemed probable that the work of parasites, and the late sowing, brought about by labor shortage, were large factors in causing such conditions. The following topics were then considered: The recent reappearance, after nine years absence, of Platygaster hiemalis in the territory under observation by the Sioux City, Iowa, station (C. N. Ainslie). The relative general importance of various factors in fly control indicated as follows: (a) Climatic conditions; (b) Agronomic practice; (c) parasites (Larrimer). The distribution of various species of parasites and of the same species over widely separated portions of the country, and the identification and synonymy of the 29 known species now being studied (Myers, Phillips, Dean, Reeves, C. N. Ainslie). The recent attempted introduction of flaxseed infested by Platygaster vernalis from Indiana into California and the recovery by Packard of two flaxseeds possibly parasitized (Larrimer). Former attempts at introduction of Platygaster from Chambersburg, Pennsyl-

vania, to Kansas (C. N. Ainslie). Introduction near Vancouver, Washington (Reeves). The identification of primary and secondary parasites of the fly in comparison with wheat jointworms (Phillips, Myers, Walton, Reeves). It was approved by the conference in this connection that it would be desirable that more intensive seasonal history work with parasites be inaugurated at the Lafayette, Indiana, laboratory, Platygaster vernalis being comparatively abundant in that territory. The value of specially trained collectors in making nation-wide studies of the Hessian fly parasites, and the factors of mountains and other natural barriers (Larrimer, Myers, Walton, Wade, Dean, Reeves, Hill).

X. - In the discussion of wheat varieties resistant to fly injury the following topics were considered: The comparative resistance of Illini Chief and other varieties under different climatic conditions. The low infestation of Illini Chief as compared with other varieties and its increased infestation when sent from Kansas to Illinois. The trial of recommended varieties at different laboratories to see how they would respond to fly infestation. (Horton, Larrimer, Dean, C. N. Ainslie.) The unsatisfactory character of head tests of different varieties (Cartwright). The value of rust-proof plants with respect to immunity to the fly (C. N. Ainslie). The hardness of stem in rye and other plants as a factor in plant resistance (Dean, C. N. Ainslie, Horton).

Wheat variety plats have been conducted since 1919 at the Centralia, Illinois, sublaboratory of the Lafayette, Indiana, laboratory on the following varieties: Illini Chief, Dawson's Golden Chaff, Poole, Leap's Prolific, Red Sea, Currel's Prolific, Michigan Amber, Roosevelt, Cooper's Red, American Bronze, Gladden, Prosperity, Red Rock, Rudy, Red Russian, Red Sea Improved, Fulcaster, Harvest King, Turkey Red, Black Hull Turkey, Kanred, Blue Stem Fultz, Ashland Fultz, Ohio 121, Michikoff. (Cartwright.)

XI. - Miscellaneous Business. The attention of the conference was directed to a manuscript by C. C. Hill of the Pennsylvania laboratory entitled "The Relation of Hessian Fly Damage to Yield" and the question was discussed as to the desirability of omitting therefrom certain tabular matter which, though useful to professional entomologists, yet in a paper for popular distribution might not be correctly interpreted, and it was agreed that the omission of same would enhance the popular usefulness of the paper (Dean, Hill, Larrimer, Horton, Satterthwait). In this connection the question was raised as to whether or not the publication from time to time of short papers on various phases of the Hessian fly problem by individuals of the Bureau staff would set precedents that would in any way anticipate or interfere with the publication of a general progress report at some subsequent date. After some discussion it was agreed that the publication of such papers would not interfere with a comprehensive work later on. (Larrimer, Horton, Hill, Dean.)

There was also some discussion of the unknown elements which enter into the selection by the fly of the points of attack on the plants and comparative data on the fly and jointworms were presented (C. N. Ainslie,

Phillips, Larrimer, Myers, Satterthwait). The lack of real information on the mechanical factors of feeding and selection of large or small stems, the voluntary or involuntary character of the action of the fly, and the various influences covering the fly's reactions were considered (Reeves, C. N. Ainslie, Dean, Larrimer, Phillips).

At the conclusion of the conference it was agreed that the general character of such informal discussions had proved to be of such mutual helpfulness that, if possible, a similar conference should be held at some subsequent date, preferably next year, at Kansas City, Missouri, in connection with the meeting of the American Association for the Advancement of Science.

The conference adjourned at 3.45 p.m.